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**FINAL TASK PLAN
HYDRAZINE BLENDING AND STORAGE FACILITY
INTERIM RESPONSE ACTION IMPLEMENTATION**

Harding Lawson Associates

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Form Approved
OMB No. 0704-0188

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1. AGENCY USE ONLY (Leave blank) 2. REPORT DATE
08/30/89 3. REPORT TYPE AND DATES COVERED

4. TITLE AND SUBTITLE
HYDRAZINE BLENDING AND STORAGE FACILITY, INTERIM RESPONSE ACTION IMPLEMENTATION, FINAL TASK PLAN 5. FUNDING NUMBERS

6. AUTHOR(S) DAAA15 88 D 0021

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
HARDING LAWSON ASSOCIATES 8. PERFORMING ORGANIZATION
REPORT NUMBER
92174R06

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
ROCKY MOUNTAIN ARSENAL (CO.), PHRMA 10. SPONSORING/MONITORING
AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED 12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)
THIS DOCUMENT PRESENTS A SUMMARY OF THE TASK ORDER SCOPE OF WORK AND TECHNICAL APPROACH FOR HYDRAZINE BLENDING AND STORAGE FACILITY INTERIM RESPONSE ACTION. THIS PLAN ALSO DESCRIBES PERFORMANCE SPECIFICATIONS, DESIGN OBJECTIVES, AND OPERATION AND MAINTENANCE REQUIREMENTS FOR THE HYDRAZINE WASTEWATER TREATMENT SYSTEM TO BE IMPLEMENTED AT THE HBSF. THIS TASK PLAN INCLUDES THE FOLLOWING APPENDICES: (A) SAMPLING PLAN. (B) QUALITY ASSURANCE PROGRAM PLAN. (C) SAFETY PLAN. (D) RESPONSES TO COMMENTS SUBMITTED BY EPA AND SHELL OIL COMPANY. (APPENDICES A, B, AND C ARE THREE SEPARATE VOLUMES, APPENDIX D IS AT THE END OF THE TASK PLAN).

14. SUBJECT TERMS
IRA H, SAFETY PLAN, QAPP, SAMPLING PLAN 15. NUMBER OF PAGES

16. PRICE CODE

17. SECURITY CLASSIFICATION
UNCLASSIFIED 18. SECURITY CLASSIFICATION
OF THIS PAGE 19. SECURITY CLASSIFICATION
OF ABSTRACT 20. LIMITATION OF ABSTRACT



92174R06
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TECHNICAL SUPPORT FOR ROCKY MOUNTAIN ARSENAL

Hydrazine Blending and Storage Facility
Interim Response Action Implementation

Final Task Plan

August 30, 1989
Contract Number DAAA15-88-D-0021
Task IRA H Phase I (Delivery Order 0003)

Rocky Mountain Arsenal
Information Center
Commerce City, Colorado

PREPARED BY
HARDING LAWSON ASSOCIATES

PREPARED FOR
OFFICE OF THE PROGRAM MANAGER FOR
ROCKY MOUNTAIN ARSENAL

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1.0 INTRODUCTION

This Task Plan has been prepared as Data Requirement A005, a requirement under Delivery Order 0003 (Task IRA H Phase I) of contract number DAAA15-18-D-0021 between Harding Lawson Associates (HLA) and its subcontractors and the U.S. Department of the Army (Army).

This document presents a summary of the Task Order scope of work and technical approach for the Hydrazine Blending and Storage Facility (HBSF) Interim Response Action (IRA). This plan also describes performance specifications, design objectives, and operation and maintenance requirements for the hydrazine wastewater treatment system to be implemented at the HBSF.

1.1 TASK SUMMARY

The HBSF at the Rocky Mountain Arsenal (RMA), near Denver, Colorado, was constructed in 1959 and operated for 23 years from 1959 to 1982. The 10-acre site consists of two tank yards, each completely surrounded by security fencing. The yards are connected by two overhead pipelines.

The HBSF was used as a depot to receive, blend, store, and distribute hydrazine fuels. The primary operation was blending of anhydrous hydrazine and unsymmetrical dimethylhydrazine (UDMH) to produce Aerozine 50. The materials were manufactured elsewhere and shipped to RMA for blending. Blending operations were not continuous and occurred in response to requests by the U.S. Air Force. Other operations at the HBSF included loading and unloading rail cars and tanker trucks, destruction of off-specification Aerozine 50, and storage of Aerozine 50, anhydrous hydrazine, monomethyl hydrazine (MMH), monopropellant hydrazine, hydrazine 70, UDMH, and hydrazine.

Hydrazine and UDMH are unstable in the natural environment and rapidly decompose when exposed to the atmosphere. One of the decomposition products of UDMH is n-nitrosodimethylamine (NDMA), a suspected human carcinogen. From January through March 1982, the U.S. Occupational Safety and Health Administration (OSHA) surveyed the HBSF and detected the

presence of airborne NDMA within the HBSF. In May 1982, RMA ceased operations and closed the HBSF to all but safety-essential or emergency-response entries.

On February 1, 1988, a proposed Consent Decree was filed in the case of *U.S. v. Shell Oil Company* with the U.S. District Court in Denver, Colorado. A modified version of the Consent Decree was filed on June 7, 1988. On February 17, 1989, a Federal Facility Agreement (FFA) that incorporates the provisions of the modified Consent Decree was executed by the U.S. Army, Shell Oil Company, the U.S. Environmental Protection Agency (EPA), the U.S. Department of the Interior (DOI), the U.S. Department of Justice (DOJ), and the U.S. Department of Health and Human Services (DHHS). The FFA specifies a number of IRAs to alleviate certain concerns prior to the final remedial action. IRA H, Closure of the HBSF, is to be implemented at the HBSF. The IRA process described in the FFA requires preparation of an Assessment Document, a Decision Document to include Applicable or Relevant and Appropriate Requirements (ARARs), and a Draft Implementation Document prior to implementation of the response action. At this time, the Assessment Document and Decision Document have been completed. HLA will develop the Draft Implementation Document. This section presents a summary of the scope of work for the task.

1.1.1 Task Order Scope of Work

The HBSF IRA H Task has been separated into two phases, which comprise the decommissioning of the HBSF at RMA. Phase I includes planning, wastewater treatment system selection and modification (including bench/pilot-scale testing), full-scale system installation, analytical method development and laboratory method certification, treatment system start-up testing, and development of a Draft Implementation Document for facility decommissioning. Phase II will involve planning, installation of a second wastewater treatment system, operational treatment of hydrazine wastewater, reduction and elimination of the facility hazards, dismantling of all above-ground structures and equipment, disposal of generated solid and liquid waste

streams, and preparation of a Technical Report to document facility decommissioning. The present Task Order addresses only Phase I of IRA H.

1.1.2 Objectives

The principal Phase I objectives are to:

- Conduct a bench/pilot-scale testing program to select an appropriate chemical oxidation/ultraviolet (UV) irradiation treatment system for treatment of hydrazine wastewater stored at the HBSF
- Determine necessary treatment system modifications to achieve the desired discharge concentrations for the chemicals of concern in the wastewater
- Develop and certify an analytical method for analysis of NDMA in treated wastewater to attain the lowest technologically achievable Certified Reporting Limit (CRL)
- Conduct start-up testing of the selected full-scale treatment system at the HBSF
- Gather sufficient process information from the start-up testing to more specifically define operational treatment requirements
- Prepare a Draft Implementation Document defining step-by-step procedures for decommissioning above-ground equipment and treatment of remaining hydrazine wastewater at the HBSF

1.1.3 Task Elements

Phase I of IRA H is being performed under four separate task elements numbered as Work Breakdown Structure (WBS) elements:

- WBS Element .10 - Planning
- WBS Element .20 - Contamination Survey
- WBS Element .60 - Treatment/Disposal Operations
- WBS Element .90 - Management/Administration

1.1.3.1 Planning

The Planning task element involves preparation of five plans, document reviews, and general project planning necessary to accomplish the task. This Task Plan references three of the other planning documents as appendices: Sampling Design Plan, Quality Assurance Program Plan (QAPP), and Safety Plan. Cover pages and detailed tables of contents for these plans are

provided. The fifth plan, the Resource Utilization Plan (RUP), provides organizational, schedule, and budget information relative to the task.

1.1.3.2 Contamination Survey

The Contamination Survey task element includes (1) sampling treated and untreated hydrazine wastewater during bench/pilot-scale and start-up testing, (2) developing an analytical procedure and certifying a laboratory for analysis for NDMA, (3) analysis of hydrazine wastewater for specific target parameters as required for bench/pilot-scale and start-up testing, and (4) implementation of the QA/QC program as defined in the QAPP. Significant aspects of the Contamination Survey element include the following:

- Baseline characterization of the hydrazine wastewater
- Chemical analyses of wastewater samples collected during the bench/pilot-scale testing program
- Treatment of approximately 10,000 gallons of hydrazine wastewater during start-up testing
- Certification of a fixed facility laboratory for the required analytical tests proposed during treatment plant start-up testing
- Chemical analyses of wastewater samples collected during treatment plant start-up
- Chemical analyses of air samples for NDMA and hydrazine fuels to monitor the integrity of the treatment system and to document any personnel exposures
- The EPA Industrial Source Complex Dispersion Model (EPA, 1987) will be used to determine whether exposure to Off-Post areas will occur if airborne NDMA is released from the hydrazine wastewater treatment system

1.1.3.3 Treatment/Disposal Operations

This task element comprises (1) bench/pilot-scale testing of chemical oxidation/UV treatment systems, (2) selection and specification of a full-scale treatment system and design of required modifications and installation details, (3) purchase and modification of the treatment system, (4) installation and start-up testing of the treatment system, (5) development of a Draft Implementation Document addressing wastewater treatment and the decommissioning of the HBSF, and (6) preparation of an Operation and Program Manual and a System Safety Hazard

Analysis Report (SSHAR) for the wastewater treatment system. Significant aspects of the Treatment/Disposal Operations element include the following:

- Bench/pilot-scale testing by three vendors to select a system for treatment of hydrazine wastewater. Such testing will be conducted at vendor facilities or existing field installations.
- Installation of two standard ozone/UV, hydrogen peroxide/UV, or other suitable treatment systems of 1,000-gallon batch capacity. One such unit will be used for start-up testing at the HSBF. The second unit will be ordered after start-up testing is completed for use during Phase II of this Task.
- Possible temporary onsite storage of the 10,000 gallons of wastewater treated during the start-up testing. It is anticipated that treatment system installation will require two months. Start-up testing is scheduled to last two additional months. At the present time, it is assumed that wastewater generated from start-up operations will be stored in tanks until such time that analytical results support that discharge requirements to the RMA sanitary sewer have been met.
- The Draft Implementation Document will address treatment of approximately 300,000 gallons of hydrazine wastewater and step-by-step decommissioning procedures for the remainder of the HBSF.

1.1.3.4 Management/Administration

This task element includes necessary coordination and interaction among HLA, PMRMA, O.H. Materials Corporation (OHM), Illinois Institute of Technology Research Institute, (IITRI), and other involved parties; project status review meetings; cost/schedule status reporting; and staff and subcontractor management. Project team organization, prime and subcontractor roles and responsibilities, and key staff assignments will be described in the RUP.

1.2 TECHNICAL APPROACH

The technical approach to IRA H Phase I encompasses the following five elements:

- Bench/Pilot-Scale Testing
- System Selection and Design Modifications
- Wastewater Analyses
- Installation and Start-Up Testing
- Development of Draft Implementation Document for Decommissioning

1.2.1 Bench/Pilot-Scale Testing

Chemical oxidation/UV has been previously identified in the Task Order as the preferred technology for treatment of hydrazine wastewater at the HBSF. As part of the treatment technology selection process, bench/pilot-scale testing of equipment at vendor facilities will be performed using representative wastewater from the HBSF. During testing, influent and effluent wastewater samples will be analyzed for target parameters described in Section 6.2 of the QAPP to measure the effectiveness of the treatment system. Process modifications, such as catalysts, will be employed as necessary to enhance treatment efficiency. The technical approach of the testing is to gather sufficient design and operation information for system selection and design modification for application to the HBSF.

1.2.2 System Selection and Design Modifications

Treatment system selection criteria will be developed to evaluate and select the most appropriate chemical oxidation/UV system for treating the hydrazine wastewater. Such criteria will include results of bench/pilot-scale testing, cost, degree of modifications required, operating history, degree of process warranty provided by the manufacturer, and equipment availability. Design modifications will be predicated on project schedule, cost, results of bench/pilot-scale testing and design experience of IITRI with the process, and the treatment standards established for NDMA.

1.2.3 Wastewater Analysis

During the bench/pilot-scale and start-up testing programs, wastewater will be analyzed to evaluate treatment technology efficiency and provide water-quality data for assessing discharge of treated effluent wastewater. Wastewater samples will be analyzed for organic and inorganic parameters by analytical methods described in Section 6.2 of the QAPP.

1.2.4 Installation and Start-Up Testing

A standard package chemical oxidation/UV treatment system will be modified, as required, by the equipment vendor and will be installed at the HBSF with further modifications, as necessary. Start-up testing will be conducted at the HBSF with one treatment system sized at one-half the capacity needed for operational treatment during Phase II. The testing program will be designed to establish how closely the Target Reporting Limit (TRL) of 1.4 parts per trillion (ppt) NDMA (as specified in the Final Decision Document) can be achieved and to optimize system performance given the project schedule, technological feasibility, and system modification cost. System modifications, as necessary, are planned to be made onsite. Specifications for a second treatment system of capacity equal to the first will be prepared on the basis of start-up testing results.

1.2.5 Development of Draft Implementation Document for Decommissioning

Development of a step-by-step decommissioning procedure will involve a review of existing decommissioning documents, results of start-up testing, and a detailed inspection of the facilities and as-built drawings. Interviews will be held with RMA staff involved in prior decommissioning work at the HBSF to document the state of hazard reduction and to identify contaminants and facilities requiring removal. Facility drawings will be located and reviewed relative to existing facilities, the "Hydrazine Blending and Storage Facility Wastewater Treatment and Decommissioning Assessment" (Ebasco and others, 1988), and known decommissioning work to date. The facility will be inspected in detail, and a phased decommissioning approach will be developed. Results of treatment system start-up testing will be integrated into the decommissioning task sequence to ensure that treatment facilities are available to treat rinsewater generated during decommissioning.

2.0 TREATMENT SYSTEM

A major objective of this task is to treat wastewater stored at the HBSF for complete, permanent, and environmentally safe destruction of contaminants of concern. A number of remedial technologies have been reviewed and screened for this purpose (EBASCO and others, 1988). After laboratory testing and detailed alternatives analysis, the chemical oxidation with simultaneous ultraviolet irradiation process was recommended for treating the HBSF wastewater.

Although relatively new in wastewater treatment, chemical oxidation/UV technology has been the subject of considerable research for a number of years (Neuman and Jody, 1986; Castegnaro and Walker, 1976; and Sundstorm and Klei, 1983). Results of this research indicate that this technology can effectively destroy a variety of organic compounds. At present, chemical oxidation/UV technology has been applied most often in experimental settings. However, Aerojet Corporation has installed a field demonstration unit in Sacramento, California, where this technology has been applied in conjunction with other technologies.

2.1 REQUIRED NEW DESIGN AND TECHNOLOGY

A limited amount of experimental or field data are available on treatment of wastewater containing hydrazine fuels and NDMA. Most research in this field has been conducted by ITRI (EBASCO and others, 1988; and Snow and Kosenka, 1987). Such research indicates the following:

- Chemical oxidation/UV technology is appropriate for thorough oxidation of hydrazine fuels, NDMA, and certain chlorinated hydrocarbons.
- UDMH is converted to NDMA as an intermediate during the oxidation reaction.

Based on in-house information and bench-scale data, ITRI developed process criteria for scale-up and design of a full-scale system, which is being fabricated at White Sands Missile Range for the U.S. Air Force (Jody, 1983). Because this technology is relatively new, chemical oxidation/UV process equipment is available from only a few vendors. These vendors have limited experience treating wastewater containing hydrazine fuels or NDMA, and their

experience is generally limited to in-house bench-scale tests or field demonstrations primarily for treating volatile chlorinated hydrocarbons in ground water.

Three vendors have been identified for this technology. Based on results from bench/pilot-scale testing, the standard process equipment or the treatment technology in general may be modified to accommodate RMA wastewater. Modifications may be necessary to provide:

- Required destruction of hydrazine fuels and NDMA, which may be present in the raw wastewater or be produced as an intermediate oxidation product during the treatment process. This may include modification of a gas-liquid contacting device for better mixing during reaction or addition of a catalyst to reduce the reaction time and increase the destruction efficiency for each organic chemical.
- Pretreatment of the wastewater to remove sediments, precipitate metals, and eliminate other contaminants that may interfere with complete oxidation of the contaminants of concern.

2.2 TREATMENT SYSTEM PERFORMANCE SPECIFICATIONS

The treatment system will have the capacity to treat approximately 300,000 gallons of wastewater containing hydrazine, MMH, UDMH, NDMA, certain chlorinated hydrocarbons, and related oxidation products over a seven-month period. Preliminary performance requirements for the treatment system are described below:

2.2.1 Treatment System Flow Capacity

- Two treatment systems are required, each capable of treating a minimum of 5000 gallons of wastewater per week based on a 5-day week and a maximum of 16 hours of operation per day.

2.2.2 Wastewater Treatment Requirements

- Concentrations of organic and inorganic parameters previously identified in hydrazine wastewater are shown in Table 2.1. Actual concentrations of these parameters may vary significantly from those shown.
- NDMA will be treated to a target concentration of 1.4 ppt in wastewater (or to the lowest achievable CRL) plus an additional period of treatment time if an extrapolated treatability curve provides confidence that the Ambient Water Quality Criteria (AWQC) can be attained through additional treatment time.
- Concentrations of hydrazine, UDMH, MMH, certain chlorinated hydrocarbons, and related oxidation products in treated effluent will meet the effluent discharge criteria for the RMA sanitary sewer.

Table 2.1: Analytical Results - Wastewater from the
HBSF Facility, RMA, Colorado

Parameter	Unit	Concentration*
Arsenic	mg/l	0.0070
Cadmium	mg/l	0.0022
Chromium	mg/l	0.0010
Lead	mg/l	0.0010
Mercury	mg/l	0.0050
Selenium	mg/l	0.0004
Silver	mg/l	0.0020
Sodium hypochlorite	mg/l	0.0250
Chlorine residuals	%	0.1400
Hydrazine	mg/l	<5.0 - 1500.0
Monomethyl hydrazine (MMH)	mg/l	<5.0 - 104.00
Unsymmetrical dimethyl hydrazine (UDMH)	mg/l	<5.0 - 1600.0
N-nitrosodimethylamine (NDMA)	µg/l	2.9 - 360
Methylene chloride	mg/l	0.06 - 33.0
Chloroform	mg/l	<0.0005 - 15.0
1,1-Dichloroethane	µg/l	<1.7 - 1.93
1,1-Dichloroethylene	µg/l	<0.73 - 5.0
Tetrachloroethane	µg/l	<20.0
Dimethylcyanamide	µg/l	<20.0
N-N-dimethylformamide	µg/l	<20.0
1-ethyl 1H 1,2,4-Triazole	µg/l	<20.0
Endrin	µg/l	0.0100
Lindane	µg/l	0.0100
Methoxychlor	µg/l	0.2000
Toxaphene	µg/l	0.0100
2,4,5-TP (Silvex)	µg/l	0.1000

* Typical concentration ranges; actual concentration may vary

Reference: EBASCO and others, 1988

- The treatment system will be flexible enough to accommodate varying concentrations of hydrazine fuels, NDMA, and certain chlorinated hydrocarbons in the wastewater.
- Any metal or nonmetal used as a catalyst must meet the effluent discharge criteria for the RMA sanitary sewer.

2.3 DESIGN OBJECTIVES AND FEATURES

A premanufactured chemical oxidation/UV treatment system is planned for use in treating hydrazine wastewater at the HBSF. The design objectives are to define installation and process details for the system and to specify necessary modifications resulting from bench/pilot-scale and start-up work. Design will occur in two stages. The first stage will address the treatment system to be furnished for start-up testing. The second stage design will comprise record drawings showing system modifications, specifications, and installation drawings for the second treatment unit to be installed during Phase II. Specific features currently envisioned for the system are described below.

2.3.1 Instrumentation and Control

- The treatment system will be equipped with necessary instrumentation for performance evaluation, process monitoring, and control during the treatment process, assuming essentially continuous operator presence. Continuous operator presence will occur only when the plant is operating.
- Motors, switches, starters, controls, and other electrical equipment will comply with local and the National Electrical Code and will be designed for operation under severe weather conditions and hazardous situations in an outside environment.

2.3.2 Wastewater/Oxidant Mixing

- Design should include proper mixing of the wastewater liquids, chemical oxidant, and any catalyst prior to or inside the reaction chamber through sparging systems or other means to attain the target treatment levels.

2.3.3 Materials for Construction

- Construction materials for the reactor and other accessories that may come in contact with the wastewater must be compatible with the raw wastewater, hydrogen peroxide, and ozone under expected basic and acidic conditions.

2.3.4 Safety Features

- A preliminary operation and maintenance manual will be completed prior to operational treatment.
- The ultraviolet radiation used for treatment must be contained inside the reaction chamber. Operating personnel will not be exposed to unsafe radiation levels as established by federal and local regulations.
- The treatment system will be designed with an enclosure to contain liquids in the event of an accidental spill of the treated or untreated wastewater.
- The system will be designed for automatic shutdown in the event of a process malfunction (e.g., temperature build-up inside the reactor or loss of power to the main treatment unit).

2.3.5 Transportability

- The treatment system will be self-contained and of modular construction for ease of dismantling.
- The treatment system must be compact, skid mounted, and transportable by truck. The design of the system will comply with State of Colorado vehicle codes.

2.3.6 Ease of Modification

- The system will be designed with self-contained processing units to include ready access for ease of modification.

2.3.7 Pretreatment/Post Treatment

The treatment system will include:

- Influent pretreatment modules, if necessary, for precipitation of trace metals and/or pH adjustment.
- An effluent pH adjustment module, if necessary, to comply with RMA sanitary sewer discharge requirements.
- Appropriate off-gas treatment modules, (e.g., an ozone destruction catalyst unit to comply with applicable air emission regulations).

2.3.8 Other Design Features

- The system will use commercially available and proven components wherever possible.
- The system will be designed for automatic operation and control during extended batch processing times.
- Rapid restart of the treatment system to maximum performance levels is required.

- Design will allow wastewater being processed to be sampled without unit shutdown.

2.4 OPERATION AND MAINTENANCE

During start-up testing and operational treatment, the treatment system will receive essentially continuous operator attention. Accordingly, automatic operational controls will be limited to those furnished as standard equipment with the system and those needed for efficient processing. Operational concerns include rapid start-up after shutdown, negligible exposure of contaminants to operators, ease of sample collection, and convenient operational controls for changing batch times and other process variables.

Maintenance of the chemical oxidation/UV system should be limited to removing sediments and other contaminants from any pretreatment stages, changing UV lamps as necessary, and replacing catalyst as required. Given the relatively short-term start-up and operational treatment stages, significant maintenance is not expected.

The treatment system design will incorporate the following operation and maintenance requirements:

- Flexibility to treat different batch volumes of wastewater. For smaller batch volumes, system design will include proper adjustment of the feed rate of chemical oxidant and will prevent overheating of the UV lamps.
- Adequate sampling points to monitor the progress of reaction during the treatment process.
- Semi-automatic batch processing.
- Automatic shutdown in the event of a system failure.
- Minimal equipment servicing, including the ozonator, oxygen feed system, reactor, UV lamps, filters, driers, feed pumps, and catalyst system during the scheduled seven months of system operation over Phases I and II.
- Wherever possible, use of commercially available and proven components that are easily replaceable.
- Easy connection of the pumping and piping system from the existing hydrazine wastewater storage tanks to the treatment units.
- Sample collection without system shutdown.
- Fully drainable treatment system.

3.0 LIST OF ACRONYMS AND ABBREVIATIONS

ACI	- American Concrete Institute
ANSI	- American National Standards Institute
ARARs	- Applicable or Relevant and Appropriate Requirements
Army	- U.S. Department of the Army
ASTM	- American Society for Testing and Materials
AWQC	- Ambient Water Quality Criteria
AWWA	- American Water Works Association
CAR	- Contaminant Assessment Report
CDH	- Colorado Department of Health
CFR	- Code of Federal Regulations
CFSR	- Contract Fund Status Report (Deliverable A018)
COC	- Chain of Custody
COR	- Contracting Officer's Representative
CPR	- Cardiopulmonary Resuscitation
CRL	- Certified Reporting Limit
CRZ	- Contamination Reduction Zone
CSSR	- Cost/Schedule Status Report (Deliverable A001)
DHHS	- U.S. Department of Health and Human Services
DHSO	- Designated Health and Safety Officer
DOI	- U.S. Department of the Interior
DOJ	- U.S. Department of Justice
DOT	- U.S. Department of Transportation
DR	- Data Requirements (Deliverable A021)
ECD	- Electron capture detector
EPA	- U.S. Environmental Protection Agency

ESE	- Environmental Science and Engineering
f/cc	- Fibers per cubic centimeter of air
FFA	- Federal Facility Agreement
GC/FID	- Gas Chromatography/Flame Ionization Detector
GC/MS	- Gas Chromatography/Mass Spectrometry
GC/NPD	- Gas Chromatography/Nitrogen Phosphorous Dector
GC/TEA	- Gas Chromatography/Thermal Energy Analyzer
GFCI	- Ground fault circuit interrupters
HBSF	- Hydrazine Blending and Storage Facility
HCL	- Hydrochloric Acid
HLA	- Harding Lawson Associates
HSM	- Health and Safety Manager
HSO	- Onsite Health and Safety Officer
HSP	- Health and Safety Plan
HWCL	- Hazardous Waste Container Log
HZ	- Hydrazine
IEEE	- Institute of Electrical and Electronic Engineers
ID	- Identification Number
IITRI	- Illinois Institute of Technology Research Institute
IRA	- Interim Response Action
IRA H	- RMA IRA Task H for HBSF, Phase I
IRDMS	- Installation Restoration Data Management System
LTD QTY	- Limited Quantity
mg/l	- Milligram per liter
µg/l	- Microgram per liter
MIL-STD	- Military Standard
MMH	- Monomethyl hydrazine

MSDS	- Material Safety Data Sheets
MSHA	- Mine Safety and Health Administration
NDMA	- N-nitro sodimethylamine
NEC	- National Electrical Code
NEMA	- National Electrical Manufacturer Association
NIOSH	- National Institute for Occupational Safety and Health
nm	- Nanometer
NOS	- Not otherwise specified
NTIS	- National Technical Information Service
O&M	- Operation and Maintenance
ODC	- Other direct costs
OHM	- OH Materials Corporation
Organizations	- EPA, CDH, and Shell Oil Company
ORM	- Other regulated materials
OSHA	- U.S. Occupational Safety and Health Administration
PBC	- Polychlorinated biphenyl
PEL	- Permissible exposure level
PHA	- Preliminary Hazard Analysis
PID	- Photoionization detector
PKGS	- Packages
PMRMA	- Program Manager for Rocky Mountain Arsenal
PO	- Purchase order
ppb	- Parts per billion
PPE	- Personal protective equipment
ppm	- Parts per million
ppt	- Parts per trillion
PSN	- Proper shipping name

PVC	- Polyvinyl chloride
QA	- Quality assurance
QAC	- Quality Assurance Coordinator
QAPP	- Quality Assurance Program Plan
QC	- Quality control
RI	- Remedial Investigation
RMA	- Rocky Mountain Arsenal
RUP	- Resource Utilization Plan
SARA	- Superfund Amendments and Reauthorization Act of 1986
SCBA	- Self-Contained Breathing Apparatus
SE	- Subelement
SHA	- System Hazard Analysis
Shell	- Shell Oil Company
SOP	- Standard Operating Procedure
SSHAR	- Safety System Hazard Analysis
SSO	- Site Safety Officer
SSPC	- Steel Structures Painting Council
SW	- Solid Waste
TLV	- Threshold Limit Values
TRL	- Target Reporting Limit
TWA	- Time-Weighted Average
UDMH	- Unsymmetrical dimethyl hydrazine
UN	- United Nations
USATHAMA	- U.S. Army Toxic and Hazardous Materials Agency
USCG	- U.S. Coast Guard
UV	- Ultraviolet
WBS	- Work Breakdown Structure

WE - Work Element
WWTP - Wastewater Treatment Plant

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Appendix A
SAMPLING DESIGN PLAN

TECHNICAL SUPPORT FOR ROCKY MOUNTAIN ARSENAL

**Hydrazine Blending and Storage Facility
Interim Response Action Implementation**

**Final Sampling Design Plan
(Appendix A to Task Plan)**

**August 30, 1989
Contract Number DAAA15-88-D-0021
Task IRA 4 Phase I (Delivery Order 0003)**

PREPARED BY

Harding Lawson Associates

PREPARED FOR

**OFFICE OF THE PROGRAM MANAGER FOR
ROCKY MOUNTAIN ARSENAL**

THIS DOCUMENT IS INTENDED TO COMPLY WITH THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969.

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QUALITY ASSURANCE PROGRAM PLAN

TECHNICAL SUPPORT FOR ROCKY MOUNTAIN ARSENAL

**Hydrazine Blending and Storage Facility
Interim Response Action Implementation**

**Final Quality Assurance Program Plan
(Appendix B to Task Plan)**

**August 30, 1989
Contract Number DAAA15-88-D-0021
Task IRA H Phase I (Delivery Order 0003)**

PREPARED BY

**Harding Lawson Associates
OH Materials, Inc.**

PREPARED FOR

**OFFICE OF THE PROGRAM MANAGER FOR
ROCKY MOUNTAIN ARSENAL**

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Appendix C
SAFETY PLAN

TECHNICAL SUPPORT FOR ROCKY MOUNTAIN ARSENAL

**Hydrazine Blending and Storage Facility
Interim Response Action Implementation**

**Final Safety Plan
(Appendix C to Task Plan)**

**August 30, 1989
Contract Number DAAA15-88-D-0021
Task IRA H Phase I (Delivery Order 0003)**

PREPARED BY

**Harding Lawson Associates
O.H. Materials Corporation**

PREPARED FOR

**OFFICE OF THE PROGRAM MANAGER FOR
ROCKY MOUNTAIN ARSENAL**

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Appendix D

RESPONSES TO COMMENTS SUBMITTED BY EPA AND SHELL OIL COMPANY

10 1 AUG 1989 *nd*



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII

999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2405

JUL 31 1989

Ref: 8HWM-SR

Mr. Donald L. Campbell
Office of the Program Manager
Rocky Mountain Arsenal
ATTN: AMXRM-PM
Commerce City, Colorado 80022-2180

Re: Rocky Mountain Arsenal (RMA)
Draft Final Task Plan, Hydrazine
Blending and Storage Facility
(HBSF), Interim Response Action
Implementation, June 1989.

Dear Mr. Campbell:

We have reviewed the above referenced document and the accompanying Sampling Design Plan, Quality Assurance Program Plan, and the Safety Plan for this IRA. We have the enclosed comments. The more important issues were discussed at the HBSF Subcommittee on July 21, 1989, and were resolved in these discussions with Army representatives. Please contact Linda Grimes at (303) 293-1262, if you have questions on this matter.

Sincerely,

Linda Grimes

for Connally Mears
EPA Coordinator for RMA Cleanup

Enclosure

cc: Jeff Edson, CDE
David Shelton, CDE
Vicky Peters, CAGO
Lt. Col. Scott P. Isaacson
Chris Hahn, Shell
R. D. Lundahl, Shell
John Moscato, DOJ
David Anderson, DOJ

levels to predict the potential loading of BOD on the sewage treatment plant. A discharge of 1,000 gallons of treated wastewater with a high BOD concentration could have an adverse effect on the sewage treatment plant, possibly causing a violation of the effluent limitations in the NPDES permit.

7. Draft Final Task Plan, page 5, clarify the text that further treatment of the 10,000 gallons of startup wastewater may be necessary to achieve acceptable discharge levels. What is the anticipated storage time in tanks?

8. Draft Final Task Plan, page 7, last paragraph, is there a prediction of the anticipated quantity of rinse water produced and subsequently treated by this system and released to the sewer system? The decommissioning phase should review other methods to decontaminate the storage units, since the levels of NDMA in the air within the tanks used to blend, formulate, and store hydrazine ranges from 0.20 ug/m³ to 28 ug/m³ (page 8, Draft Final Safety Plan).

9. Draft Final Task Plan, pages 5 and 11, we note that weather impacts have been considered in the selection and design of the electrical system. Have temperature effects on the UV/oxidation process performance been evaluated?

10. Draft Final Task Plan, pages 9 and 10, and Draft Final Sampling Design Plan, pages 5 and 6, the text states that pretreatment may be necessary to remove sediments, metals, and other contaminants. The concentrations of other contaminants should be better evaluated and Table 2.1 expanded to indicate their levels. This assessment should include the analyses results for pH, hardness (scale control on UV quartz tubes), total organic carbon, chloride, ammonia, nitrate, etc. Also, further testing should be done to better define the concentration levels; for example, Table 2.1 lists UDMH at concentrations ranging from greater than 5 to 1000 ppm. If the impact of concentration variation on system optimization has been evaluated, the results should be presented.

11. Draft Final Task Plan, page 11, since the catalyst has not been identified at this point, its effluent discharge may not be regulated as part of the NPDES discharge to the RMA sanitary sewer. After a catalyst has been selected, notify EPA so that we can assure proper monitoring is occurring.

12. Draft Final Task Plan, pages 12 and 13, the text states that the supervision of the treatment process will be limited to 16 hours; will the reaction proceed unmonitored by an operator beyond this point? Will there be checks/alarms to alert temperature buildup or leakage; is there a remote alarm notification system? It is stated that an automatic shutdown

testing will occur following review and comment by the parties of the Implementation Document (refer to Sections 22.13 and 22.14 of the FFA). Please amend the text to reflect that this agreed procedure will be followed.

22. Draft Final Task Plan, the following technical information, regarding the bench scale/pilot testing program, is requested:

- a. What type of reactor system is going to be used for the bench scale test and what are the scale-up problems associated with that system?
- b. Are different intensity UV lamps to be evaluated in this phase?
- c. Are different UV wavelengths to be evaluated in this phase?
- d. What data will be generated to do the treatment extrapolation for NDMA required by the Final Decision Document?
- e. Are different treatment pHs to be evaluated?
- f. Will the effluent from the bench/pilot testing be evaluated for the formation of degradation by-products which have been observed in other testing?
- g. Will pH measurements be taken on the influent and effluent samples from the bench/pilot testing?
- h. Will the sampling procedure minimize vapor space in the sample containers to ensure that VOCs are not purged from the sample during transport?

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- g. Will pH measurements be taken on the influent and effluent samples from the bench/pilot testing?
- h. Will the sampling procedure minimize vapor space in the sample containers to ensure that VOCs are not purged from the sample during transport?

FCD:July 31 , 1989:asap\hbsfrv.new

bcc: Connally Mears, 8HWM-SR
Linda Grimes, 8HWM-SR
Kay Modi, 8HWM-SR
Bill Clemmens, 8RC
Mike Gaydosh, 8RC
Bruce Ray, 8RC
Mike Smith, CDM

RESPONSES TO COMMENTS SUBMITTED BY THE
U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION VIII, ON THE
DRAFT FINAL TASK PLAN, SAMPLING DESIGN PLAN,
QUALITY ASSURANCE PROGRAM PLAN, AND SAFETY PLAN FOR THE
HYDRAZINE BLENDING AND STORAGE FACILITY
INTERIM RESPONSE ACTION

Comment No. 1

Passages from the Decision Document, on pages 33, 34, and 52, reflect EPA's understanding of the Army's agreed approach to treatment of the hydrazine blending and storage facility wastewater. The Army agreed to attempt lowering of the detection limit for NDMA and extrapolation of the treatment curve to attain the Ambient Water Quality Criteria for NDMA of 1.4 ppt, prior to release from the treatment system. Following discussions with Army staff, it is our understanding that page 7, Section 1.2.4, and page 9, Section 2.2.2, of the Draft Final Task Plan, will be modified to reflect the approach agreed upon in the Decision Document.

Response

EPA's understanding is correct, and the text of the Task Plan has been modified to reflect the approach agreed upon in the Decision Document.

Comment No. 2

As discussed at the HBSF Subcommittee and as agreed by the Army, we wish to emphasize that we fully anticipate compliance with ARARs established for this IRA during the onpost pilot treatment studies. Further, all onpost treatability studies, with potential for releases, are subject to ARARs analysis and compliance.

Response

Comment noted.

Comment No. 3

Although soils and groundwater remediation are not within the scope of the IRA, we recommend the development of a certified reporting limit for NDMA in soils to be conducted during the IRA work. These issues were discussed at the HBSF Subcommittee, and the Army representatives suggested inclusion of this soil sampling as part of the data gap soils study. We request that soils sampling in the HBSF area following decommissioning be considered a data gap and be addressed by that soil sampling program.

Response

EPA's understanding that soils and ground-water remediation are not within the scope of the IRA is correct; therefore, a CRL for NDMA in soils will not be developed during the IRA work. Soil sampling for NDMA in the HBSF area was conducted in 1988 and 1989. The data and results were presented in the "Final Phase I Contamination Assessment Report, Site 1-7, Hydrazine Blending and Storage Facility, Version 3.2" (September 1988) and in the "Final Phase II Data Addendum, Site 1-7, Hydrazine Blending and Storage Facility, Version 3.1" (February 1989). It should be noted that no NDMA was detected at or above detection limits in either study and that

the detection limit was lowered by a factor of 10 between Phase I and Phase II. The Army believes that sufficient data already exist on NDMA in soils in the HBSF area and therefore does not consider HBSF soils sampling for NDMA to be a data gap.

Comment No. 4

It is our understanding that the assumption that destruction of NDMA would appropriately destroy other contaminants (including chlorinated hydrocarbons) would be further assessed during the initial system tests to properly select compounds to be monitored. Based on discussions with Army representatives, the currently planned pilot testing and startup testing will include this evaluation.

Response

EPA's understanding is correct.

Comment No. 5

We have concerns that potential air release of NDMA was evaluated for workers only and not offpost areas. At our request, Army representatives have agreed to conduct an evaluation of the potential for the exposure of offpost areas and the placement of statements in the Task Plan to reflect this.

Response

EPA's understanding is correct, and the following text will be added as a seventh bullet in Section 1.1.3.2 of the Task Plan: "The EPA Industrial Source Complex Dispersion Model (EPA, 1987) will be used to determine whether exposure to Off-Post areas will occur if airborne NDMA is released from the hydrazine wastewater treatment system."

Comment No. 6

The plan does not monitor for BOD₅ and chemical oxygen demand of the effluent from the treatment system. The BOD₅ and chemical oxygen demand should be compared with the influent levels to predict the potential loading of BOD on the sewage treatment plant. A discharge of 1,000 gallons of treated wastewater with a high BOD concentration could have an adverse effect on the sewage treatment plant, possibly causing a violation of the effluent limitations in the NPDES permit.

Response

Based on the existing analytical results for hydrazine wastewater at the HBSF and anticipated concentrations of NDMA, hydrazine fuels, and other organics in treated effluent from the hydrazine wastewater treatment system, the BOD₅ and COD concentrations in the treated effluent are expected to be insignificant.

To verify BOD₅ and COD concentrations in the treated effluent from the hydrazine wastewater treatment system, BOD₅ and COD analyses will be included in the start-up testing program.

Comment No. 7

Draft Final Task Plan, page 5, clarify the text that further treatment of the 10,000 gallons of startup wastewater may be necessary to achieve acceptable discharge levels. What is the anticipated storage time in tanks?

Response

Treated effluent from the chemical oxidation/UV treatment system will be stored in effluent storage tanks prior to discharge. Samples of the effluent will be shipped for analyses to the analytical laboratory certified for analysis of NDMA and hydrazine fuels. Based on the results of the analyses relative to CRLs for these compounds, the treated effluent will be either discharged to the RMA sanitary sewer or directed to the hydrazine wastewater treatment system for further treatment.

The anticipated storage time for the treated effluent is approximately 30 days, the length of time required to receive preliminary corrected results from the analytical laboratory.

Comment No. 8

Draft Final Task Plan, page 7, last paragraph, is there a prediction of the anticipated quantity of rinse water produced and subsequently treated by this system and released to the sewer system? The decommissioning phase should review other methods to decontaminate the storage units, since the levels of NDMA in the air within the tanks used to blend, formulate, and store hydrazine ranges from 0.20 $\mu\text{g}/\text{m}^3$ to 28 $\mu\text{g}/\text{m}^3$ (page 8, Draft Final Safety Plan).

Response

An estimate of the anticipated quantity of rinse water generated during decommissioning, subsequently treated by the hydrazine wastewater treatment system, and discharged to the RMA sanitary sewer is not available at this time. An estimate will be prepared and will be included in the Draft Implementation Document for decommissioning of the HBSF.

All decontamination methods were assessed in the assessment phase of the IRA and were presented in the Final Assessment Document. The Final Decision Document for the IRA specifies the decommissioning process.

Comment No. 9

Draft Final Task Plan, pages 5 and 11, we note that weather impacts have been considered in the selection and design of the electrical system. Have temperature effects on the UV/oxidation process performance been evaluated?

Response

Temperature effects on the performance of the UV/oxidation process treating hydrazine wastewater from the HBSF have not been evaluated to date. These effects will be evaluated during the start-up testing phase of this task. The temperature of the hydrazine wastewater will increase during the UV/oxidation process. A chiller will be included with the hydrazine wastewater treatment system to control temperature increase.

Comment No. 10

Draft Final Task Plan, pages 9 and 10, and Draft Final Sampling Design Plan, pages 5 and 6, the text states that pretreatment may be necessary to remove sediments, metals, and other contaminants. The concentrations of other contaminants should be better evaluated and Table 2.1 expanded to indicate their levels. This assessment should include the analyses results for pH, hardness (scale control on UV quartz tubes), total organic carbon, chloride, ammonia, nitrate, etc. Also, further testing should be done to better define the concentration levels; for example, Table 2.1 lists UDMH at concentrations ranging from greater than 5 to 1000 ppm. If the impact of concentration variation on system optimization has been evaluated, the results should be presented.

Response

The impact of concentration variation on optimization of the hydrazine wastewater treatment system has not been evaluated to date. Additional sampling and analysis of the contents of the three tanks that contain hydrazine wastewater at the HBSF will be conducted to better assess concentrations of the parameters listed in Table 2.1 of the Draft Final Task Plan. Analyses for parameters that may affect performance of the hydrazine wastewater treatment system (e.g., pH, hardness) will be performed. The sampling locations, parameters, and methods of analysis for this additional sampling and analysis will be presented as an addendum to the Sampling Design Plan prior to the work being performed.

Comment No. 11

Draft Final Task Plan, page 11, since the catalyst has not been identified at this point, its effluent discharge may not be regulated as part of the NPDES discharge to the RMA sanitary sewer. After a catalyst has been selected, notify EPA so that we can assure proper monitoring is occurring.

Response

Comment noted. The Army will coordinate with EPA to ensure that necessary revisions are made to the NPDES permit application where appropriate. EPA will be notified when a catalyst has been selected.

Comment 12

Draft Final Task Plan, pages 12 and 13, the text states that the supervision of the treatment process will be limited to 16 hours; will the reaction proceed unmonitored by an operator beyond this point? Will there be checks/alarms to alert temperature buildup or leakage; is there a remote alarm notification system? It is stated that an automatic shutdown will occur in the event of a system failure; are any operator procedures required following automatic shutdown?

Response

No remote alarm notification system is planned, as an operator will be present at all times during system operation. Instrumentation will be included with the system to monitor process parameters such as temperature, pH, pressure, and flow rate. Real-time monitoring will be included for airborne hydrazine fuels. Non-real-time monitoring will be performed for airborne NDMA. Tanks within the system will include high-level alarms.

Operator procedures following automatic shutdown will be required. These procedures will be outlined in the Draft Operation and Program Manual for the hydrazine wastewater treatment system. This manual will be prepared prior to start-up operation of the system.

Comment No. 13

Draft Final Safety Plan, page 7, is ground water monitoring being conducted for the inground concrete tank? Is this tank covered?

Response

Ground-water monitoring for the in-ground concrete tank/sump will not be conducted as a part of Phase I of this IRA. The tank is not covered.

Comment No. 14

Draft Final Safety Plan, page 7, from what drum filling and washing operations were residues collected and stored in the inground concrete tank?

Response

The statement on page 7 of the Draft Final Safety Plan regarding drum filling and washing operations refers to page 1-13 of the Final Assessment Document, which states that dirty drums and drums to be reused were cleaned before filling, and residues were poured into the in-ground tank/sump. This statement reflects all information in the available documents.

Comment No. 15

Draft Final Safety Plan, page 7A, the figure should include the location of the inground tank and the equipment sheds.

Response

Figure 3.1 of the Final Safety Plan has been modified to show the locations of the in-ground tank and equipment sheds.

Comment No. 16

Draft Final Safety Plan, page 23, Section 6.6, what are the predetermined concentrations against which ambient air levels will be monitored?

Response

The U.S. Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs) and American Conference of Government Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) for hydrazine, MMH, and UDMH are as follows:

	<u>PEL and TLV</u>
Hydrazine	0.1 ppm
MMH	0.2 ppm
UDMH	0.5 ppm

Comment No. 17

Draft Final Safety Plan, refer to earlier Comment 5, regarding public protection, the system will be equipped with an audible alarm activated when the Threshold Limit Value (TLV) of 0.1 ppm is exceeded. When the plant is unattended, the audible/visual alarm will be activated, how will RMA personnel be aware of the alarm; is there a remote alarm notification system? Also, this section establishes a notification procedure, which is not inclusive of public notification. Procedures and levels must be determined that are protective of the public and a contingency plan developed for releases that could impact public health.

Response

No remote alarm notification system is planned, as an operator will be present at all times during system operation. PMRMA has an established notification procedure that will be followed.

Comment No. 18

Draft Final Sampling Design Plan, pages 8 and 10, in regard to the evaluation of the off-gassing from a nonozone system, there are contradictions. In one case, it is stated that the off-gas stream will not be sampled; in the second instance, it is stated that the off-gassing from the hydrogen peroxide process will be evaluated. Please amend the text to clarify this apparent contradiction.

Response

Section 3.1.5 of the Sampling Design Plan refers to off-gas testing during bench/pilot-scale testing; no off-gas testing is planned for the non-ozone unit during bench/pilot-scale testing. Section 3.2.4 refers to off-gas testing during start-up testing; the selected treatment unit will be tested for off-gassing during start-up testing. Whether an ozone or a non-ozone chemical oxidation/UV system is selected, provisions will be incorporated in the design of the hydrazine wastewater treatment system to collect gases that may be generated in the unit processes and tanks employed in the treatment system. The design will include a series of seal water tanks, through which off-gases must pass. At the end of a batch run during start-up operation, the seal water will be analyzed to determine whether off-gassing occurred during the run.

Comment No. 19

Draft Final Sampling Design Plan, page 13, are CRLs currently in existence for other contaminants of concern in the wastewater?

Response

Yes. CRLs exist for all contaminants listed on page 10 of the Draft Final Task Plan except (1) sodium hypochlorite and chlorine residuals, which do not have certifiable methods and (2)

dimethylcyanamide, N-N-dimethylformamide, 1-ethyl 1H 1,2,4-Triazole, and Silvex, which at this point are considered tentatively identified compounds (TICs).

Comment No. 20

Draft Final Quality Assurance Program Plan, page 4, please list what materials, other than anhydrous hydrazine and unsymmetrical dimethylhydrazine, were loaded and unloaded here. Also, expand the text to include any history of spills of these substances here.

Response

The Final Assessment Document contains the information pertaining to history of loading and unloading as well as spills.

Comment No. 21

Draft Final Quality Assurance Program Plan, pages 5 and 7, it is our understanding that the Draft Implementation Document will address the treatment of the approximately 300,000 gallons of hydrazine wastewater. Further, we understand that the selection of the "full-scale treatment system" and its startup testing will occur following review and comment by the parties of the Implementation Document (refer to Sections 22.13 and 22.14 of the FFA). Please amend the text to reflect that this agreed procedure will be followed.

Response

EPA's understanding that the Draft Implementation Document will address treatment of approximately 300,000 gallons of hydrazine wastewater is correct. Selection of the full-scale treatment system and its start-up testing, however, will occur during the design phase of the project and prior to issuing the Draft Implementation Document. As discussed at the RMA Subcommittee meeting on July 21, 1989, the full-scale treatment system has been selected, and, based on the results of the start-up testing, any necessary modifications will be implemented and recommendations for full-scale treatment will be made. Modifications and recommendations will be presented in the Draft Final Implementation Document for review and comment by the parties, per Sections 22.13 and 22.14 of the Federal Facility Agreement.

Comment No. 22

Draft Final Task Plan, the following technical information for the bench scale/pilot testing program, is requested:

- A. *What type of reactor system is going to be used for the bench scale test and what are the scale-up problems associated with that system:*

Response

Three chemical oxidation/UV reactor system configurations will be evaluated during the bench/pilot-scale testing program:

- Hydrogen peroxide/ozone (or ozone alone) in combination with multiple low-intensity UV rays (254 nm wavelength); bench-scale

- Hydrogen peroxide in combination with multiple high-intensity UV lamps (254 nm wavelength): bench-scale
- Hydrogen peroxide/ozone (or ozone alone) in combination with a single medium-intensity UV lamp (broad wavelength: 200 to 350 nm): pilot-scale

Scale-up problems, if any, are unknown at this time and cannot be predicted.

B. Are different intensity UV lamps to be evaluated in this phase?

Response

Yes, see response to Comment 22A.

C. Are different UV wavelengths to be evaluated in this phase?

Response

Yes, see response to Comment 22A.

D. What data will be generated to do the treatment extrapolation for NDMA required by the Final Decision Document?

Response

Because of the volume of sample required to characterize the treated effluent generated from a particular bench-scale or pilot-scale run, no sampling during the intermediate stages of a run is anticipated. Thus, generation of concentration versus time curves or kinetic modeling for treatment of NDMA is not an objective of the bench/pilot-scale testing program. Generation of data for extrapolation of treatment for NDMA is planned for the full-scale start-up testing phase of the task.

E. Are different treatment pHs to be evaluated?

Response

Yes. Each vendor will provide recommendations regarding optimum pH for treatment of hydrazine wastewater from the HBSF.

F. Will the effluent from the bench/pilot testing be evaluated for the formation of degradation by-products which have been observed in other testing?

Response

Yes. Refer to pages 5, 7A, 8, and 14 of the Draft Final Sampling Design Plan for the parameters to be analyzed in the final treated effluent samples.

G. Will pH measurements be taken on the influent and effluent samples from the bench/pilot testing?

Response

Yes.

H. Will the sampling procedure minimize vapor space in the sample containers to ensure that VOCs are not purged from the sample during transport?

Response

Yes.

Shell Oil Company



One Shell Plaza
P. O. Box 4320
Houston, Texas 77210

July 17, 1989

Office of the Program Manager for Rocky Mountain Arsenal
ATTN: AMXRM-PM: Mr. Donald L. Campbell
Rocky Mountain Arsenal, Building 111
Commerce City, Colorado 80022-2180

Dear Mr. Campbell:

Shell Oil has the following comments on the Draft Final Task Plan for Hydrazine Blending and Storage Facility Interim Response Action Implementation, June 30, 1989:

The text at Section 6.2 of the Quality Assurance Program Plan could be misleading by suggesting that all of the compounds listed in Table 6.2 are target analytes for this IRA. In fact, the compounds listed in Table 6.2 are all compounds susceptible to analysis by the respective method listed.

In Section 2.2 of the Draft Task Plan, why is the operating schedule, i.e., 5-day week, 16 hours per day, treated as a performance specification? Usually, best economies of capital and operating expense are realized by treating the operating schedule as a variable.

Sincerely,

A handwritten signature in dark ink, appearing to read "R. D. Lundahl", written over a horizontal line.

R. D. Lundahl
Manager Technical
Denver Site Project

RDL:ajg

cc: Office of the Program Manager for Rocky Mountain Arsenal
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RMA 89-1

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Denver, CO 80220

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RESPONSES TO COMMENTS SUBMITTED BY SHELL OIL COMPANY ON THE
DRAFT FINAL TASK PLAN, SAMPLING DESIGN PLAN,
QUALITY ASSURANCE PROGRAM PLAN, AND SAFETY PLAN FOR THE
HYDRAZINE BLENDING AND STORAGE FACILITY INTERIM RESPONSE ACTION

Comment No. 1

The text at Section 6.2 of the Quality Assurance Program Plan could be misleading by suggesting that all of the compounds listed in Table 6.2 are target analytes for this IRA. In fact, the compounds listed in Table 6.2 are all compounds susceptible to analysis by the respective method listed.

Response

The third sentence in the first paragraph of Section 6.2 has been changed to read: "Table 6.2 presents a summary of analytical methods used for analysis of wastewater samples along with the compounds susceptible to analysis by each method."

Comment No. 2

In Section 2.2 of the Draft Task Plan, why is the operating schedule, i.e., 5-day week, 16 hours per day, treated as a performance specification? Usually, best economies of capital and operating expenses are realized by treating the operating schedule as a variable.

Response

Comment noted. Based on previous chemical oxidation/UV treatability work by IITRI with hydrazine wastewater, the length of a batch-mode run was estimated to be approximately 14 hours. Thus, a 16-hour time period for one batch-mode run is estimated for start-up testing of the full-scale hydrazine wastewater treatment system at the HBSF. Results of the start-up testing will establish the optimal batch-mode treatment time for the full-scale treatment system.

No comments were received from the State of Colorado on the Draft Final Task Plan, Sampling Design Plan, Quality Assurance Program Plan, and Safety Plan for the Hydrazine Blending and Storage Facility Interim Response Action.